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THE NIGHT SNAKES OF BAJA CALIFORNIA

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Fig. 1. The type specimen (SDSNH 44680) of *Hypsiglena torquata catalinae*. Photo by Dallas Clites.

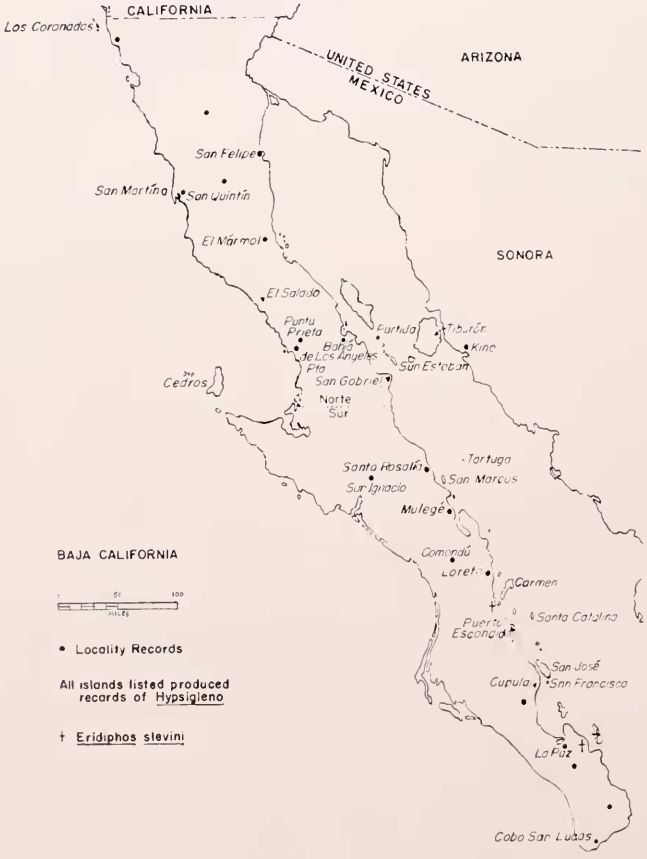

Fig. 2. Map of Baja California, showing the locality records for *Hypsiglena* and *Eridiphas*.

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The genus *Hypsiglena* appears to range throughout all of peninsular and most of insular Baja California. Specimens are now available from the Los Coronados Islands, San Martín Island and Cedros Island on the Pacific coast and the following islands in the Gulf of California: Tiburón, San Esteban, Tortuga, San Marcos, Carmen, San José, Partida (Norte), and Santa Catalina. The size of an island or its distance from the peninsular coast does not appear to affect the distribution. Islands such as Tortuga and Santa Catalina are small and are among the islands farthest removed from the coastline. It is therefore expected that other islands not now known to be inhabited by *Hypsiglena* will be included in the area of distribution in the future.

Based on distribution alone, it is obvious that *Hypsiglena* is an old inhabitant of Baja California, arriving while the islands were still connected to the peninsula.

The concept that *Hypsiglena* and *Leptodeira* are closely related and probably derived from a common ancestor has been discussed by several authors (Dunn, 1936; Taylor, 1939; Tanner, 1946; Duellman, 1958; Leviton and Tanner, 1960). The hypothesis of Leviton and Tanner, that *Eridiphas* is not only an intermediate but also a more primitive genus than either *Hypsiglena* or *Leptodeira*, provides a new concept which may aid in understanding the geographical distribution of these genera, at least in the area of northwestern Mexico and southwestern United States. Seemingly, *Eridiphas* or its ancestral stock was extant in western Mexico and spread into Baja California at an early date, very likely before *Hypsiglena* or *Leptodeira* became serious competitors. Based on present-day distribution, however, *Hypsiglena* may never have been a serious competitor because of its preference for a more xeric habitat. *Leptodeira*, on the other hand, has a preference for mesic or streamside habitats, as does *Eridiphas*, and being an aggressive modern group, *Leptodeira* seemingly eliminated the ancestral *Eridiphas* from areas in which both formerly may have existed.

Anderson (1950) believed that the present Gulf of California north of latitude 25° N was land up to Late Miocene or Early Pliocene, at which time crustal deformations along its western edge caused the present depression. Durham and Allison (1960, fig. 3) also believed that the northern part of the Gulf of California was land as far south as San Esteban Island. They disagree, however, with Anderson as to time, fixing this stage earlier — in the Oligocene or Early Miocene. Thus the distribution of *Eridiphas* stock may have reached southern Baja California by a shorter route before the present Gulf of California was formed. Assuming this to be correct, *Eridiphas* is a relict of a once more widespread group of snakes in western Mexico.

Presumably *Leptodeira* did not reach Baja California before land connections between it and the mainland of Mexico were broken and has not extended its range far enough north to enter Baja California from California. It is really doubtful that the range of *Leptodeira* ever extended farther north than its present distribution because of the drier and/or cooler climates to the north. Indications are that its range has been recently extended north through adaptive radiation. Thus, migration of *Eridiphas* stock in Late Oligocene, Miocene, or Early Pliocene presumably reached Baja California over land bridges connecting the mainland to Baja California. This seems more plausible since we find no relict populations of *Eridiphas* or a similar mesic species north of the distribution of *Leptodeira*.

The cooler temperatures of the Pleistocene apparently prevented a movement north. As the climate changed from that of the Pleistocene to the present desert conditions over much of this area, only the distribution of *Hypsiglena* was favored. Since Pleistocene times, *Hypsiglena* has extended its distribution to include most of northern Mexico and much of adjoining southwestern and western United States.

The extensive distribution of *Hypsiglena*, however, raises some doubt that its ancestral stock remained in the southern warmer climates during the Pleistocene. Today these snakes are found in relatively cool habitats along the northern edge of the range. It would therefore seem logical to assume that *Hypsiglena* entered southwestern United States and Baja California before the close of the Pleistocene and was thus able to reach many offshore islands on both sides of peninsular Baja California before the land bridges between the peninsula and the islands were swamped by the rising sea level resulting from the melting ice. According to Wells and Jorgensen (1964) the climate from 8,000 to 40,000 years ago was significantly less arid than at present in southern Nevada and southeastern California.

Few species of North American snakes have a wider area of distribution than *Hypsiglena torquata*. This has permitted the development of many subspecies, with some appearing (or at least considered by some herpetologists) to be specifically distinct. The question of whether *torquata torquata* and *torquata ochrorhynca* are subspecies or distinct species presumably is not yet settled. Dixon (1965) suggests that two species exist. This is based on the fact that both forms coexist in Sonora and Sinaloa, Mexico. Although I am not prepared to discuss this problem in the present study, I have seen enough material from the critical areas to realize that much more material must be examined before accepting any additional changes in the taxa. It should be pointed out that *Hypsiglena* is an extremely variable and plastic group of snakes, fully capable of the presently reported variations. Therefore, until more material is examined, a change in the specific nomenclature of these snakes is not considered desirable.

Specimens used in this study were provided by Mr. Allan J. Sloan, assistant curator of reptiles and amphibians at the San Diego Society of Natural History (SDSNH); Drs. Clarence J. McCoy and T. Paul Maslin, University of Colorado Museum (UCM); Dr. James R. Dixon, New Mexico State University (NMSU); Dr. Alan E. Leviton, California Academy of Sciences (CAS); Dr. Robert C. Stebbins, University of California (MVZ); and Brigham Young University (BYU). The more recent SDSNH specimens were collected on two (1962, 1964) expeditions sponsored largely by the Belvedere Scientific Fund and the National Science Foundation and under the direction of Dr. George E. Lindsay. I am grateful to the above individuals and institutions for the opportunity to study their material.

Hypsiglena torquata catalinae, subsp. nov.

Type. — An adult male, San Diego Society of Natural History 44680, taken on Santa Catalina Island, approximately 25° 38′ N, 110° 47′ W, Gulf of California, Baja California, Mexico, by George E. Lindsay, June 25, 1964 (fig. 1).

Paratypes. — Topotypes, SDSNH 44376 and 44681; UCM 25949-51; BYU 23556.

Diagnosis. — This subspecies of *H. torquata* is most closely related to *H. t. venusta* and *H. t. ochrorhyncha* of the peninsula of Baja California. It is readily distinguished from *venusta* by the single series of large dorsal spots which are larger and fewer in number, by the presence of only two rather than three rows of lateral spots, and by the high ventral plus caudal total of 240 or more scutes. From *H. t. ochrorhyncha* of the Cape region, *catalinae* is distinguished by the greater number of caudals (up to 63 in males) and also by the much higher ventral plus caudal totals. From *tortugaensis* of Tortuga Island, *catalinae* is distinguished by having the lateral nape spot continuous from the nape anterior to the eye and by having the dorsal scale formula usually reduced to 21-21-17-15. In both *tortugaensis* and *catalinae* the ventral plus caudal totals are high (240 or more). All other subspecies occurring in Baja California, except *tortugaensis*, have a noticeably lower caudal count, usually less than 50, whereas the count in *catalinae* ranges from 52 to 63 scutes.

Description of Type. — Head and body proportions normal, total length 371 mm., tail 70 mm., ratio of tail to total length .188; dorsal scale formula 21-21-17-15, reduction to 19 rows occurring at ventral 118, to 17 rows at ventral 132 and to 15 rows at ventral 170; ventrals 182, with three pairs of gulars between the first ventral and the posterior chinshields; caudals 63, including tip; supralabials 8-8; infralabials 10-10; preoculars 3-3; postoculars 2-2; loreal single; temporals 1-2-3 right, and 1-3-4 left side.

Color pattern consisting of five longitudinal rows of dark brown spots on a grayish-brown ground color; dorsal row of 66 large spots, each spot involving 15-21 scales, outer edge margined with darker brown or black flecks; first lateral row of spots alternating with dorsal series, spots smaller and involving only four to six scales, center of spots lighter in color; second lateral row alternating with first lateral row and opposite dorsal series, spots smaller and involving three to four scales; scales between dorsal and first lateral row lighter in color, producing two narrow but distinct stripes.

Nape with three large spots; a median spot 9 scales long and about 4.5 scales wide, involving scale directly posterior to parietals and fused with first spot of dorsal series; lateral nape spots complete, covering most of last supralabials, upper edge of labial 5 and lower postocular, narrowly separated on each side from median spot by a narrow cream-colored edging which extends anteriorly along edges of lateral nape spots to eyes; head finely and uniformly flecked with darker gray-brown spots; gulars, chinshields and lateral edges of ventrals and caudals finely flecked, center of ventrals and caudals immaculate.

Variation. — The male paratypes are similar to the type in nearly all details. One female, UCM 25950, has 191 ventrals, which is in the usual range of eight to ten scales more than in the males. A second female, SDSNH 44681, has a low ventral count of only 182 scales. This low number of ventrals is either aberrant or it represents in this subspecies a lower ventral count than is usually found in females. The ventrals range from 181 to 184 (182.2) in males and from 182 to 191 in the females. Caudals range from 62 to 63 in males and from 52 to 54 in the females.

Variation in the head scales occurs in the number of preoculars, with three specimens having three scales on one or both sides and one with a single scale on one side; other specimens have two preoculars. The temporals vary from 1-2-2 to 1-3-3 or 1-2-4; the usual temporal formula appears to be 1-2-3. There is little variation in the ratio of tail to total length, with males averaging 18.5 per cent (18.2-18.8) and the females approximately three per cent lower at 15.4 per cent.

Little variation occurs in color pattern except that the nape spots may or may not be separated. In four paratypes, one or both lateral spots are fused with the median spot. The anterior part of the median spot is separated from the posterior part in only one paratype and reaches the scale posterior to the parietals in all specimens. A variation of ten dorsal body spots occurs in the series (56-66). Spots average about two to three times the length of the light intervening spaces. Perhaps a character not yet fully considered in *Hypsiglena* is the narrowness of the space between dorsal spots. In *catalinae* the spots are relatively large, yet there are as many or more spots as in some subspecies with smaller spots.

Discussion

A review of the taxonomic characters used to identify the subspecies of *Hypsiglena* indicates that the color pattern is highly variable and should be used on the basis of (a) body and (b) head and nape patterns. The body patterns may vary in: size and number of middorsal spots; whether the dorsal spots form one or, as in *venusta*, two rows; presence of two or three rows of lateral spots.

The nape pattern usually consists of three large spots, one median and two lateral. Variation in the median spot may result in the following: (a) a long narrow stripe extending posteriorly from the parietal for 10 to 14 scales; (b) a narrow anterior projection with a greatly, often abruptly, expanded posterior part, usually 8 to 10 scales long; (c) the median spot united with the lateral spots to form an irregular nape collar. In all three pattern types the anterior part of the median spot may be divided from the posterior part and may or may not contact the parietals or the scales immediately posterior to the parietals.

Variation in the size and shape of the lateral nape spots is as follows: (a) an extension of the spot anterior to the eye; (b) the spot broken at or posterior to the angle of the jaw; (c) the spots united with the median spot to form an irregular nape collar.

At least six scale patterns now serve as key characters in separating the subspecies. They are as follows: (1) The dorsal scale rows are usually 21-21-17 in *tortugaensis*, but 23-21-19-17

in *martinensis* and usually 21-21-17-15 in *baueri*, *gularis*, *klauberi*, *catalinae*, *venusta* and *deserticola*. (2) In the ventrals the total range for Baja California specimens is 161-191, with the lower counts occurring in *klauberi* and the higher ones in *catalinae* and *tortugaensis*. (3) The caudals range from 38 to 65, with *gularis*, *klauberi*, *martinensis*, *deserticola* and *baueri* on the lower end of the range. In these subspecies the counts average less than 50 caudals, although a few males may range above 50. The highest counts are in *tortugaensis* (3 females, 57-59, and 1 male, 65; average 59.5) and *catalinae* (2 females, 52-54, and 5 males, 62-63, average 59.8). Intermediate between these extremes in males is *venusta* with an average of 57 scutes. (4) Ventral plus caudal totals provide a more reliable criterion than either the ventrals or caudals when taken alone. *Hypsiglena* specimens with high ventral counts normally have higher caudal counts (an exception to this may occur in *baueri* and *gularis*, where the ventrals in the females are high at 189 and 183-185 respectively, but the caudals are low at 45 or fewer); thus the total of these two counts usually provides a more reliable character. In this character *tortugaensis* and *catalinae* are above 240 combined ventral and caudal scutes, whereas all other subspecies are below, *klauberi* averaging females 227 and males 223, *venusta* females 235 and males 234, and *ochrorhyncha* females 227 and males 225. Other subspecies are not represented in sufficient numbers to provide data on variation in this characteristic; however, the specimens which are available indicate an approximate position in the subspecies series: *gularis*, 226-228; *baueri*, male 216 and females 209 and 234; *martinensis*, 237; and *deserticola*, based on specimens which appear to be intergrades between *deserticola* and *klauberi*, 230-235. (5) The loreals are variable. In *martinensis* and *loreala* the formula is 2-2; however, only the type is available for *martinensis*, and as an occasional specimen of other subspecies in Baja California shows an increase to two loreals, one might regard this character in *martinensis* with suspicion until additional specimens are available. (6) Gulars surrounding the chinshields are usually small and readily distinguishable from other adjoining scales. However, in *gularis* (Tanner, 1954) there is an exception in that those gulars posterolateral to the posterior pair of chinshields are enlarged and elongated so as to appear as a third pair of chinshields.

There is now little doubt that the subspecies *deserticola* enters northeastern Baja California. Specimens taken at El Mármol (SDSNH 41416 and 41583) and at Punta Prieta (SDSNH 11552 and 52918) represent intergrades between *klauberi* and *deserticola*. The nape pattern in all except SDSNH 11552 is like *deserticola;* however, the ventrals and caudals are lower (males, ventrals 173-174, caudals 46-46; females, ventrals 180-187, caudals 41-45), averaging approximately as reported by Tanner (1946:42) for *klauberi*. Geographically, this is as it should be, for the Sierra San Pedro Mártir terminates north of these localities and presumably permits the two subspecies to meet and intergrade south of that range. A female specimen from Bahía de los Angeles (SDSNH 38614) on the Gulf coast also indicates intergradation; the nape and head patterns are a combination of both subspecies. The median spot is shaped like that of *deserticola* but is three scales posterior to the parietals, and the lateral nape spots are divided at the angle of the jaws as in *klauberi*. Ventral and caudal counts (187 and 45) are in the lower part of the range of variation for *deserticola* and in the higher range for *klauberi*. With intergradation established in specimens taken at El Mármol to the north and Bahía de los Angeles and Punta Prieta to the south, it should be expected that *deserticola* would occur south along the Gulf coast, perhaps as far as the southern end of the Sierra San Pedro Mártir. Likewise, *klauberi* should range south a similar distance on the western slopes, along the Pacific side, before intergradation becomes apparent.

Zweifel (1958:15) discussed a male specimen (AMNH 75578) taken 5 miles north and east of Punta Santa Rosalía on the Pacific coast of Baja California. The scale characters (ventrals 181 and caudals 51) and the head and nape patterns (median spot to scale posterior to parietal and lateral blotches weakly continuous with stripes posterior to the eye) when compared with the specimens from Punta Prieta, a locality only 15 miles northeast, indicates that it is also an intergrade between *klauberi* and *deserticola*. The intergrades available to me do not show any influence of *venusta*, and I would not expect that subspecies in northern Baja California unless it extends north along the Gulf coast from Santa Rosalía to the vicinity of Punta San Gabriel (28° 26′ N. 112° 56′ W).

Two specimens (BYU 21992-3) taken 45 miles northwest of La Paz are *ochrorhyncha*, as are specimens from San Francisco Island (SDSNH 44377-8) and San José Island (SDSNH 44379). An area of intergradation between *ochrorhyncha* and *venusta* should lie between Loreto and Carmen Island in the north and the northern part of La Paz Bay and the coastal islands of San Francisco and San José to the south. The lack of material from the Vizcaíno Desert and the Pacific coastal uplands between it and the Magdalena Plain limits a further consideration of the peninsular subspecies. Until material is available from these areas, one cannot determine the northern distribution of *ochrorhyncha*, the western distribution of *venusta*, and the area of intergradation of the latter with *ochrorhyncha* or with the intergrading populations of *klauberi* and *deserticola* to the north. The presently known locality records indicating the distribution are listed on the map (fig. 2).

Material

Specimens examined other than the type series of *H. t. catalinae* are as follows:

H. t. ochrorhyncha. — 45 mi. NW La Paz, BYU 21992-3; San José Island, SDSNH 44379; San Francisco Island, SDSNH 44377-8.

H. t. venusta. — Carmen Island, CAS 51814, SDSNH 44382-3 and 44679.

H. t. tortugaensis. — Tortuga Island, SDSNH 44380-1.

H. t. baueri. — Cedros Island, SDSNH 17339.

H. t. klauberi × *deserticola.* — Bahía de los Angeles, SDSNH 38614; El Mármol, SDSNH 41416 and 41583; Punta Prieta, SDSNH 11552 and 59218.

Two specimens from San Esteban Island (NMSU 9038 and MVZ 74953) are not yet assigned to a subspecies.

Key to Subspecies of *Hypsiglena torquata* in Baja California

A. Lateral nape spot extending anteriorly to the eye. ..... B
Lateral nape spot divided near the angle of the mouth, not extending as a single blotch from nape to eye. ..... F

B. Dorsal spots divided into two rows, at least anteriorly, with three lateral rows of body spots; ventral plus caudal total averages 235. ..... *venusta*
(Gulf coast of peninsula from Santa Rosalía south at least to Loreto, and on Carmen and San Marcos islands).
Dorsal spots not divided into two rows; two or three rows of lateral spots; ventral plus caudal total variable. C

C. One or more pairs of gulars enlarged, appearing as a third pair of caudo-lateral chinshields; caudals 43; ventral plus caudal total 225 to 228; median nape spot enlarged posteriorly, not reaching the parietals; lateral nape spots continuous to eyes. ..... *gularis*
(Partida Island, 28° 53′ N, 113° 3′ W).
Gulars not enlarged; caudals usually more than 45; ventral plus caudal total variable; median nape spot enlarged or not. ..... D

D. Median nape spot greatly enlarged posteriorly, anterior projection only 1 to 3 scales wide, extending back from parietal 4 to 7 scales, where it enlarges to cover nearly all of dorsal nape; ventral plus caudal total more than 230, average in United States specimens 240 or more. ..... *deserticola*
(Eastern San Diego and Imperial counties, California, south in Baja California to El Mármol).
Median nape spot usually not greatly enlarged posteriorly, when enlarged not as above; ventral plus caudal total variable. ..... E

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*In attempting to key out *baueri* I could not adequately separate it from *ochrorhyncha* found in southern Baja California. In both color pattern (nape spots, size, shape, and number of body blotches, 48) and in scale patterns (caudals few and ventrals variable, male 168, and females 171-189, one low and the other high, yet both within the range) the differences are not sufficient, at least not in the few specimens reported, to distinguish between these two subspecies. I am not at this time suggesting that *baueri* is not a valid subspecies, but cannot on the basis of the available material key it out.

E. Dorsal body spots large, average 60 to 61, only two rows of lateral spots; ventral plus caudal total 240 or more; caudals 52-54 in females, 62-63 in males. ..... *catalinae* (Santa Catalina Island, Gulf of California).
Dorsal body spots smaller, less than 60, usually three rows of lateral spots; ventral plus caudal total less than 240, average less than 230; caudals average 47 in females, 55 in males, usually fewer in the Cape area. ..... *ochrorhyncha** (Cape region north to area of Cupula, including San José and San Francisco islands).

F. Median nape spot in contact with parietals or scale immediately posterior; caudals 57-65; ventral plus caudal total 242 or more. ..... *tortugaensis* (Tortuga Island).
Median nape spot not in contact with the parietals or scale posterior, anterior part often divided from the larger posterior part; caudals 39-56, ventral plus caudal total less than 240. ..... G

G. Loreals 2-2; dorsal scale formula 23-21-19-17; caudals 54 (based on one female specimen). ..... *martinensis* (San Martín Island).
Loreals usually 1-1, dorsal scale formula 21-21-19-17 (15); caudals in females 39-49. ..... *klauberi*
(South from western San Diego County, California, into Baja California at least to the area immediately north of El Salado, and on the Los Coronados Islands).

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